

Title (en)

METHOD OF MANUFACTURING AN AL-MG-SI ALLOY ROLLED SHEET PRODUCT WITH EXCELLENT FORMABILITY

Title (de)

VERFAHREN ZUR HERSTELLUNG EINES WALZBLECHPRODUKTS MIT AL-MG-SI-LEGIERUNG MIT AUSGEZEICHNETER FORMBARKEIT

Title (fr)

PROCÉDÉ DE FABRICATION D'UN PRODUIT EN FEUILLE LAMINÉ EN ALLIAGE AL-MG-SI AYANT UNE EXCELLENTE FORMABILITÉ

Publication

EP 2964800 B1 20170809 (EN)

Application

EP 14707348 A 20140218

Priority

- EP 13158176 A 20130307
- EP 2014053100 W 20140218
- EP 14707348 A 20140218

Abstract (en)

[origin: WO2014135367A1] The invention relates to a method of manufacturing an aluminium alloy rolled sheet product with excellent formability and is particularly suitable for use for an automotive body, the method comprising: (a) casting an ingot of an aluminium alloy having a composition consisting of, in wt.-%: Si 0.5 to 1.5, Mg 0.2 to 0.7, Fe 0.03 to 0.30, Cu up to 0.30, optionally one or more elements selected from the group consisting of: (Mn, Zr, Cr, V), Zn up to 0.3, Ti up to 0.15, impurities and aluminium; (b) homogenising the cast ingot at a temperature of 450 °C or more; (c) hot rolling the ingot to a hot-rolled product; (d) cold rolling of the hot-rolled product to a cold-rolled product of intermediate gauge; (e) continuous intermediate annealing of the cold-rolled product of intermediate gauge at a temperature in the range of 360-580 °C; (f) cold rolling of the intermediate annealed cold-rolled product to a sheet product of final gauge up to 2.5 mm; (g) solution heat treating said sheet product; and (h) quenching said solution heat treated sheet product.

IPC 8 full level

C22C 21/04 (2006.01); **C22C 21/06** (2006.01); **C22F 1/047** (2006.01)

CPC (source: EP US)

B22D 7/005 (2013.01 - EP US); **C22C 21/02** (2013.01 - EP US); **C22C 21/04** (2013.01 - EP US); **C22C 21/06** (2013.01 - EP US); **C22C 21/08** (2013.01 - EP US); **C22F 1/00** (2013.01 - EP US); **C22F 1/002** (2013.01 - EP US); **C22F 1/043** (2013.01 - EP US); **C22F 1/047** (2013.01 - EP US)

Citation (opposition)

Opponent : C.-Tec Constellium Technology Center

- JP 2004043938 A 20040212 - FURUKAWA SKY KK
- JP H05263203 A 19931012
- US 2003029531 A1 20030213 - BULL MICHAEL JACKSON [US], et al
- US 5728241 A 19980317 - GUPTA ALOK KUMAR [CA], et al
- OLAF ENGLER ET AL.: "Texture control by thermomechanical processing of AA6xxx Al-Mg-Si sheet alloys for automotive applications-a review", MATERIALS SCIENCE AND ENGINEERING, vol. 336, no. 1-2, 2002, pages 249 - 262, XP055496093
- G. HUPPERT, E. HORNBOGEN: "The effects of MG -Additions on precipitation behavior of AL- Si Alloys", THE 4TH INTERNATIONAL CONFERENCE ON ALUMINIUM ALLOYS, 1994, pages 628 - 635, XP055496105
- "Continuous annealing - some plant options", ALUMINIUM TODAY, February 1990 (1990-02-01), pages 10 - 20, XP055470229
- GEORGE E. DIETER: "Mechanical Metallurgy, 3rd ed.", 1986, article "20-8 Defects in formed parts", pages: 676 - 678, XP055496463
- P. CASTANY ET AL.: "Influence of quench rate and microstructure on bendability of AA6016 aluminum alloys", MATERIALS SCIENCE AND ENGINEERING A, vol. 559, 2013, pages 558 - 565, XP055496465, [retrieved on 20120905]
- J. STALEY ET AL.: "Advances in aluminium alloy products for structural applications in transportation", JOURNAL DE PHYSIQUE IV, vol. 3, no. C7, November 1993 (1993-11-01), pages 179 - 190, XP009152042

Opponent : Hydro Aluminium Rolled Products GmbH

- US 2005028894 A1 20050210 - HOFFMANN JEAN-LUC [FR], et al
- JP 2010242215 A 20101028 - KOBE STEEL LTD
- JP 2008303449 A 20081218 - FURUKAWA SKY KK, et al
- JP 2012214846 A 20121108 - KOBE STEEL LTD
- DE 69907307 T2 20040219 - FUJI PHOTO FILM CO LTD [JP], et al
- JP 2000144294 A 20000526 - KOBE STEEL LTD
- EP 1029937 A1 20000823 - KOBE STEEL LTD [JP]
- WO 9814626 A1 19980409 - ALCAN INT LTD [CA], et al
- DR. CATRIN KAMMER: "Aluminiumtaschenbuch, 16. Auflage", vol. 1, 2002, ALUMINIUM-VERLAG, pages: 682 - 685, XP055487428

Opponent : Novelis Inc.

- JP 2004043938 A 20040212 - FURUKAWA SKY KK
- JP H05263203 A 19931012
- JP 2012214846 A 20121108 - KOBE STEEL LTD
- EP 0531118 A1 19930310 - SKY ALUMINIUM [JP]
- EP 0257957 A1 19880302 - FUJI PHOTO FILM CO LTD [JP]
- JP S6347349 A 19880229 - SKY ALUMINIUM, et al
- JP H11189836 A 19990713 - KOBE STEEL LTD
- JP 2001003129 A 20010109 - KOBE STEEL LTD
- EP 1967599 A1 20080910 - SUMITOMO LIGHT METAL IND INC [JP]
- "Rolling Aluminum: From the Mine Through the Mill", THE ALUMINUM ASSOCIATION, December 2007 (2007-12-01), XP055325910
- T.A. BENNETT ET AL.: "Effect of particles on texture banding in an aluminium alloy", SCRIPTA MATERIALIA, vol. 62, no. 2, 2010, pages 78 - 81, XP026832877
- HAN, JUN-HYUN, MATERIALS SCIENCE AND ENGINEERING A, vol. 477, 2008, pages 107 - 120, XP022489927

Cited by

WO2020023367A1; EP3827108B1

Designated contracting state (EPC)

AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

DOCDB simple family (publication)

WO 2014135367 A1 20140912; CN 105026588 A 20151104; CN 105026588 B 20170825; EP 2964800 A1 20160113; EP 2964800 B1 20170809;
EP 2964800 B2 20220615; US 2016002761 A1 20160107; US 9938612 B2 20180410

DOCDB simple family (application)

EP 2014053100 W 20140218; CN 201480011882 A 20140218; EP 14707348 A 20140218; US 201414770606 A 20140218